amendments do not constitute the addition of any new matter to the specification. Applicant respectfully requests entry of the amendments and reconsideration of the application in view of the amendments and the following remarks.

Rejection of Claim 3 Under 35 U.S.C. § 102 Based on Iwai

Claim 3 has been rejected under 35 U.S.C. § 102(b) as being anticipated by Iwai (US 5,533,146). Applicant respectfully traverses this rejection. Claim 3 as amended herein patentably distinguishes the prior art.

Claim 3 now recites i) irradiating plural linear laser beams to a target area of members to be welded so as to be crisscrossed over a seam line to measure a welding state, ii) taking, as an image, said welding state in a CCD camera by means of linear laser beams reflected by said members, iii) processing said image of said welding state, and iv) controlling a laser welding head based on process data of said image.

In contrast, Iwai does not disclose the above significant and distinct features of step i). In Iwai, single laser beam instead of plural linear laser beams is used for measuring a welding state (see column 2, lines 44-45, Fig. 1, for example). Moreover, the laser beam is not irradiated so as to be crisscrossed over a seam line. Accordingly, Iwai fails to disclose every elements of the claimed invention, and withdrawal of the rejection under 35 U.S.C. § 102(b) is respectfully requested.

Rejection of Claims 1, 2 and 4-11 Under 35 U.S.C. § 103

Claims 1, 2, 7, 9 and 10 have been rejected under 35 U.S.C. § 103(a) as being unpatentable over Iwai (US '146) and further in view of JP 2000042769. Claims 4-6, 8 and 11 have been rejected under 35 U.S.C. § 103(a) as being unpatentable over Iwai (US '146) and further in view of JP 2000042769 in view of Anderson et al. (US 5,938,446).

Claims 1, 7 and 10 are independent claims and the remaining claims are ultimately dependent on either one of Claims 1, 7 and 10. These independent claims have been amended to clarify the plural linear laser beams as well as Claim 3.

In the present invention, in order to monitor a welding state, at least two semiconductor laser apparatuses are employed in addition to a laser system to perform a welding process such as a YAG laser. Moreover, at least two linear laser beams from the semiconductor laser apparatuses

are irradiated onto a seam line so as to be crisscrossed over the seam line for measuring a welding state.

As discussed above, Iwai does not teach or suggest not only using at least two linear laser beams for measuring a welding state but also using linear laser beams irradiated so as to be crisscrossed over a seam line. In Iwai, only one semiconductor laser is employed and the slit beam is irradiated from the semiconductor laser on the welding parts so as to be along the seam line, not so as to be crisscrossed over the seam line (see column 2, lines 44-45, Fig. 1, for example).

On the other hand, in the present invention, by employing the above significant features recited in the independent claims, the position of the seam line is determined by the cross points between the linear laser beams and the seam line. Moreover, when the linear laser beams are irradiated obliquely so as to be crisscrossed over the seam line, the inclinations of the welding parts can be determined by the line widths of the linear laser beams, and heights of the welding parts can be determined by the absolute position of each linear laser beams (see on page 5, lines 20-24 of the specification).

In addition, in the present invention, when plural welding process are carried out and thus, plural seam lines are formed, the fluctuation in state of the plural seam lines are monitored. In contrast, in Iwai, the state of each seam line is monitored since the laser beam is scanned along the seam line.

The Examiner asserts that although Iwai fails to disclose a CCD camera with a band pass filter, a condenser, and a processor using CAD data, JP '769 discloses the method of using a CCD camera with a band pass filter, a condenser for the purpose of which condenses the light emitted from a weld zone as becomes the optical axis and the same axle of a laser beam which is irradiated by the work is formed. Further, the Examiner asserts that although Iwai fails to teach using CAD for control welding, Anderson et al. is introduced to show the importance of CAD for read-off off data which is input to a CAD program.

However, as discussed above, Iwai does not teach or suggest using at least two linear laser beams for measuring a welding state or using linear laser beams irradiated so as to be crisscrossed over a seam line. Further, none of the remaining references does not teach or suggest the above significant features.

Thus, a combination of the above references still could not lead to the present invention. Thus, Claims 1, 7 and 10 and the claims dependent on either one of the claims could not be obvious over the references. Applicant respectfully requests withdrawal of the rejection under 35 U.S.C. § 103(a).

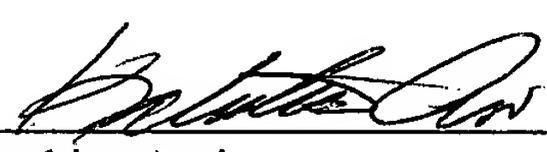
CONCLUSION

In light of the Applicant's foregoing Remarks, it is respectfully submitted that the present application is in condition for allowance. Should the Examiner have any remaining concerns which might prevent the prompt allowance of the application, the Examiner is respectfully invited to contact the undersigned at the telephone number appearing below.

Please charge any additional fees, including any fees for additional extension of time, or credit overpayment to Deposit Account No. 11-1410. A duplicate copy of this sheet is enclosed.

Respectfully submitted,

KNOBBE, MARTENS, OLSON & BEAR, LLP

Dated: April 17, 2003 By: 

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VERSION WITH MARKINGS TO SHOW CHANGES MADE

IN THE CLAIMS:

Claims 1, 3, 7 and 10 have been amended as follows:

1. (Amended) A laser welding head-controlling system comprising:

a laser irradiating body with a laser inlet and a laser outlet,

plural semiconductor lasers to oscillate plural linear laser beams configured to be crisscrossed over a seam line for measuring a welding state,

a CCD camera with a band-pass filter therein to pass through only ~~the reflected~~ linear laser beams reflected by objects to be welded to take in, as an image, ~~the measured~~said welding state by ~~the~~said reflected ~~linear laser~~ beams, and

an image processor to process ~~the~~said image of ~~the measured~~said welding state.

3. (Amended) A method for controlling a laser welding head comprising the steps of:

irradiating plural linear laser beams ~~for parts to be welded~~ to a target area of members to be welded so as to be crisscrossed over a seam line to measure a welding state ~~from plural semiconductor lasers~~,

taking, as an image, ~~the measured~~said welding state in a CCD camera by means of ~~the reflected~~ linear laser beams reflected by said members ~~into a CCD camera~~,

processing ~~the~~said image of ~~the measured~~said welding state, and

controlling a laser welding head based on ~~the processed~~process data of ~~the~~said image.

7. (Amended) A laser welding head-controlling system for controlling the position of a laser welding head with respect to an target area of objects to be welded, comprising:

at least two semiconductor lasers for emitting linear laser beams configured to be crisscrossed over a seam line at a predetermined angle toward the target area;

a CCD camera provided with a band-pass filter, through which linear laser beams reflected by the objects pass exclusively, to generate an image of the target area; and

an image processor for processing the image of the target area to determine the progress of welding, thereby controlling the position of a laser welding head.

10. (Amended) A method for controlling the position of a laser welding head with respect to a target area of objects to be welded, comprising the steps of:

emitting at least two linear lasers beams so as to be crisscrossed over a seam line at a predetermined angle toward the target area;

generating an image of the target area exclusively from linear laser beams reflected by the objects passing through a band-pass filter, using a CCD camera provided with the band-filter;

processing the image of the target area to determine the progress of welding; and

controlling the position of the laser welding head.